Dicamba Research Updates from 2019 WSSA Meeting – Cameron Douglass (EFED)

W Tubbs, K Rice, M Bish, and K Bradley, University of Missouri – Response of Insect Pest and Beneficial Species to the Timing and Severity of Dicamba Injury in Soybean [Poster]

- Dicamba injury to non-dicamba tolerant (DT) soybeans does not result in a higher incidence of either insect pests or beneficial insects in the susceptible soybeans

- Study objective was to determine if dicamba injury to non-dicamba tolerant (DT) soybeans adversely effects abundance and densities of insect pests and beneficial insects, and used "drift-level doses" (*i.e.*, rates corresponded to 1/10x, 1/100x, 1/1,000x and 1/10,000x of the field rate) of dicamba
- Results indicate that abundance of both insect pests and beneficial insects was lower (relative to untreated control) in non-DT soybeans receiving a 1/10x dose of dicamba (*i.e.* the highest applied dose) at the V3 or R1 growth stages … so abundance of insects was unaffected at doses lower than 1/10x
- Results indicate that density of both insect pests and beneficial insects was higher (relative to untreated control) in non-DT soybeans receiving a 1/100x or lower dose of dicamba

E Oseland, M Bish, K Bradley, and K Bradley, University of Missouri – Investigations of the Effects of Soil pH on the Volatility of Dicamba

- Acidic soil pH conditions may contribute to the potential for dicamba volatility, depending on the specific formulation of dicamba being used

- Study objective was to determine if low soil pH increases the volatility of various dicamba formulations (*i.e.*, Clarity, Engenia, Xtendimax, experimental choline salt [Corteva])
- Xtendimax and Engenia formulations resulted in injury similar to Clarity at soil pH levels of 4.3 and 5.3
- Xtendimax and Engenia formulations resulted in higher injury compared to experimental choline salt formulation (Corteva) at all soil pH levels
- Experimental salt formulation (Corteva) resulted in similar levels of injury compared to the untreated control at soil pH levels of 6.8, 7.7 and 8.3

E Jones, W Everman, J Sanders, D Contreras, and M Granadino, NC State University – Assessing Dicamba Injury Across Different Soybean Varieties and Maturity Groups

- Exposure to dicamba during vegetative growth stages resulted in greater injury to susceptible soybeans across all tested rates (*i.e.*, 1.08, 4.35 and 17.4 g a.e./ha) than exposure to dicamba during reproductive stages

- Study objective was to determine if soybean varieties, maturity groups, or planting date affected susceptibility to dicamba injury
- No differences in injury between maturity groups (*i.e.*, V and IV), varieties or planting dates (*i.e.*, May and June)

J Bond, K Bradley, N Corbin, K Gage, M Loux, E Miller, J Norsworthy, D Reynolds, L Steckel, and B Young, Various universities – The Effect of Multiple Dicamba Exposures on Soybean Growth and Yield

- Greatest injury was observed in soybeans exposed during late vegetative stages (*i.e.*, V4 – R2) compared to exposure during reproductive stages (*i.e.*, no statistical differences in jury for soybeans exposed at R1 – R3 vs R1 – R5), although even these soybeans exposed during the reproductive phases showed injury averaging 35% at 1/200x the dicamba field rate

- Study objective was to determine whether exposure by susceptible soybeans to multiple "sub-lethal" rates of dicamba at various growth stages resulted in relatively greater injury

O Ospitan, J Scott, and S Knezevic – University of Nebraska – Comparative Responses of Non-Dicamba Tolerant Soybean Varieties to Dicamba

- Based on results, ~0.1% of the dicamba field rate (*i.e.*, 0.56 g a.e./ha) caused 10% soybean yield loss when exposed at R1, while ~1% of the dicamba field rate (*i.e.*, 5.6 g a.e./ha) caused the same yield loss when exposed at V2 or R2

- Study objective was to determine the relative sensitivity of conventional, glufosinate-tolerant, and glyphosate-tolerant soybeans (*i.e.*, all non-dicamba tolerant varieties) to "micro-rates" of three dicamba (*i.e.*, 0.56. 1.12, 5.6, 11.2 and 56 g a.e./ha [equivalent to 1/1,000, 1/500, 1/100, 1/50, and 1/10 the standard field rate of 560 g a.e./ha]) products (*i.e.*, Clarity, Engenia and Xtendimax) applied to V2, R1 or R2 growth stages
- Three susceptible soybean varieties were all equally sensitive, with visual injuries of 20-80% and yield losses of 0-96% depending on growth stage at exposure and dicamba rate
- Exposure at R1 resulted in greater injury than exposure than exposure at V2 or R2 (based on comparison of ED values)

J Norsworthy and T Barber, University of Arkansas – Dicamba Findings in 2018

- Based on overall research, conclusion was that the newer dicamba formulations must be applied early in the growing season to minimize risk of volatility; also, glyphosate may need to be prohibited as an allowable tank-mix with newer dicamba formulations to minimize risk of volatility
- Based on 7 trials during 2017/2018, results indicate that for every hectare of DT-soybeans treated, you can expect that 1.5 hectares of non-DT soybeans will be injured

- Data presented were from large-scale drift study done in collaboration with Bayer in Arkansas, in which DT-soybean was planted in the middle of a non-DT soybean field and the DT-soybeans treated with a field rate of dicamba (Xtendimax) + glyphosate (Roundup PowerMax II) + acetochlor (Warrant) + drift retardant (Intact) at the R1 growth stage; portions of the non-DT soybeans adjacent to the treated DT-soybean area were covered with tarps or buckets to prevent spray drift affects and isolate exposure to only dicamba volatility from the treated field
- An anecdote Jason discussed was that his team had to wait for 7 days for environmental conditions that were close to label requirements, he ended up deciding to go ahead with the trial even though weather conditions did not meet label requirements. Within 24 h of the application the site's weather station measured 360° winds … which resulted in injury (5% or greater) to non-DT soybeans on all sides of the treated DT-soybeans
- Injury to non-DT soybeans that were covered during application was equivalent to injury to non-DT soybeans that were uncovered during application, *i.e.*, injury to non-DT soybeans due to dicamba volatility alone is equivalent to injury to non-DT soybeans due to spray drift
- Additional research (from low tunnel studies) presented suggested that volatility of dicamba increases when tank mixed with glyphosate (Roundup Powermax II)
- In separate trials it was observed that secondary movement of dicamba in water running off from a treated field can result in injury to non-DT soybeans, even when the event (irrigation or rainfall) causing the runoff occurs 9 days after the dicamba treatment

M Bernards, S Culpepper, G Kruger, S Nolte, J Norsworthy, D Latorre, D Reynolds, P Sikkema, C Prague, D Stephenson, R Werle, and B Young, Various universities – The Effect of Tank Mix Partners on Xtendimax Volatility

- Active ingredients (*i.e.*, glyphosate) and inert ingredients (*i.e.*, AMS) commonly tank mixed with formulations of dicamba can markedly increase the risk of dicamba volatility from the applied solutions

- Objective of these studies (conducted by multiple collaborators throughout the US and Cananda) was to identify the effect of common tank mix partners of Xtendimax on volatility
- Results suggest that the addition of AMS to Xtendimax increases injury to non-DT soybeans to exposure via volatility by up to 25% compared to injury to non-DT soybeans from Xtendimax alone
- Additionally, injury to non-DT soybeans from Xtendimax + glyphosate (Roundup Powermax II) was greater than injury to non-DT soybeans from Xtendimax alone … speaker suggested that this affect was due to glyphosate lowering the pH of the spray solution, which is known to increase dicamba volatility
- Injury observed in non-DT soybeans was much lower in Canada relative to injury observed in the southern US

B Sperry, J Calhoun, D Reynolds, J Ferguson and G Kruger, Various universities – Effect of Carrier Volume and Spray Quality of Soybean Response to Dicamba

- Carrier volume can substantially impact the results of studies investigating sublethal exposure of susceptible soybeans to dicamba, and …
- Most current studies really represent equipment contamination effects (*i.e.*, rate titrations applied at the same carrier volume [*i.e.*, standard field carrier volume would be 140 L/ha]), and might underestimate potential injury compared with studies that more accurately represent exposure via spray drift (*i.e.*, rate titrations applied with proportional carrier volume reductions)

- Study objective was to determine the effect of carrier volume and spray quality on non-DT soybean responses to a sublethal dicamba dose (*i.e.*, 1/100x or ~5.6 g a.e./ha) applied at the R1 growth stage; a pulse-width-modulation (PWM) sprayer was used to deliver 140, 105, 70, 35, 14 and 7 L/ha using either fine or coarse nozzles
- At 3 DAT, carrier volumes of 70-140 L/ha resulted in 6-16% injury, while carrier volumes of 7-14 L/ha resulted in 42-49% injury
- At 28 DAT, carrier volumes of 35-140 L/ha resulted in 39-42% reductions in plant height, while carrier volumes of 7-14 L/ha resulted in 46-51% reductions in plant height
- Across carrier volumes, fine and coarse nozzles resulted in 30 and 26% reductions, respectively, in yield losses; overall yield losses were 14-41% and increased as carrier volume decreased